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10/772,651	02/04/2004	Dong-Kil Shin	9898-341	5815

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EXAMINER

WARREN, MATTHEW E

ART UNIT PAPER NUMBER

2815

DATE MAILED: 12/04/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/772,651

Applicant(s)

SHIN ET AL.

Examiner

Matthew E. Warren

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 September 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19, 21 and 23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 and 21 is/are rejected.
- 7) ☒ Claim(s) 23 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

This Office Action is in response to the Remarks filed on September 15, 2006.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-7, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hikita et al. (US 6,133,637) in view of Kondo et al. (JP 63-240053 A) and Scranton et al. (US 6,099,783)

In re claim 1, Hikita et al. shows (fig. 9) a multi-chip package comprising: at least two semiconductor chips (14 and 16) vertically mounted on a substrate (12a) and encapsulated with a mold resin (22); and a soft element (elastomer or epoxy resin 18) located between at least one of the at least two semiconductor chips and the mold resin, the soft element being more elastic and flexible than the mold resin (col. 5, lines 24-38). Because the soft element of Hikita is formed of the same materials and structure as the applicant's claimed invention, it is also inherently configured to reduce the constrictive force of the encapsulant on the surface. In re limitation of the soft element being "adapted" to relieve stress, it has been held that the recitation that an element is "adapted to" perform a function is not a positive limitation but only requires

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the ability to so perform. It does not constitute a limitation in any patentable sense. In re Hutchison, 69 USPQ 138.

However, Hikita does not clearly disclose that the soft element relieves stress between the chips and the mold resin. Kondo discloses (abstract and fig. 2) a soft element (flexible material 9) formed on an entire upper surface and side surface of a chip (1). The soft element is formed between the chip and the mold resin (3) to protect the package from internal stress. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the package of Hikita by forming the soft element on the top surface of the chip and between the chip and the mold resin as taught by Kondo to protect the package from internal stress.

Hikita and Kondo show all of the elements of the claims except the soft element being an elastomer or epoxy resin without a filler. It is well known in the art that encapsulant materials can be formed with or without fillers to form the encapsulant having a desired property (adhesive property, hardness property, etc.) However, Scranton et al. discloses (col. 17, lines 56-61) that an epoxy resin material may be formed without a filler to so that the resin has a putty-like property. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the soft element of Hikita and Kondo by using an encapsulant material having no filler as taught by Scranton to form a soft element having a putty-like property.

In re claims 2 and 3, Hikita et al. shows (fig. 9) a soft element (epoxy resin 26) contacts an entire surface of the side or a portion of the side of the semiconductor chips.

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In re claims 4 and 5, Kondo shows (fig. 2) that the soft element contacts the entire upper surface of the chip or a portion of the upper surface of the chip (as shown in figures 1 or 3).

In re claim 6, Hikita et al. discloses (col. 5, lines 24-28) that an adhesive is applied for adhesion between the substrate and the semiconductor chips. Because the soft element of Hikita is formed of the same materials and structure as the applicant's claimed invention, it is also inherently configured to increase vertical mobility of the semiconductor chips against a load of the adhesive applied to the semiconductor chips upon cooling.

In re claim 7, Hikita et al. discloses (col. 6, lines 24-38 and col. 6, lines 25-33) that the soft element comprises elastomer or epoxy resin.

In re claim 21, although Hikita shows that a soft element is disposed between the two chips in figure 10, Hikita shows in figure 49 that there is no soft element between the chips, and when combined with Kondo, the soft element (9) of Kondo would be formed on the uppermost chip and not between the two chips of Hikita. Kondo shows that the soft element is not disposed between the chip (1) and lead frame (2).

Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hikita et al. (US 6,133,637) in view of Kondo et al. (JP 63-240053 A) and Scranton et al. (US 6,099,783) as applied to claim 1 above, and further in view of Derderian (US 6,569,709 B2).

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In re claims 8 and 9, Hikita, Kondo, and Scranton show all of the elements of the claims except the solder balls as terminals for connecting the package to an external circuit and the substrate being a PCB. Derderian et al. shows (fig. 1) a package having vertically stacked semiconductor chips (30a and 30b) and a soft element formed between them. The package is a PCB (20) having solder balls (14) formed as terminals for connecting the package to an external circuit. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the package of Hikita, Kondo, and Scranton by using solder balls as terminals as taught by Derderian to connect the package to an external circuit.

Claims 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ozawa et al. (US 6,215,182 B1) in view of Kondo et al. (JP 63-240053 A) and Scranton et al. (US 6,099,783).

In re claim 10, Ozawa et al. shows (fig. 5) a device comprising at least two semiconductor chips (22-24) stacked on a substrate; and an encapsulant (26) covering the at least two semiconductor chips. Ozawa shows all of the elements of the claim except the soft element formed on a surface of at least one of the two chips but not on surfaces between the two chips. Kondo discloses (abstract and fig. 2) a soft element (flexible material 9) formed on an entire upper surface and side surface of a chip (1). The soft element is more flexible than the encapsulant and is formed between the chip and the mold resin (3) to protect the package from internal stress. When combined with Ozawa, the soft element would not be formed between the at least two semiconductor

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chips since Ozawa relies on a film adhesive (38) to secure the chips to each other. Furthermore, Kondo shows that the soft element is not disposed between the chip (1) and lead frame (2). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the package of Ozawa by forming the soft element on the top surface of the chip and between the chip and the mold resin as taught by Kondo to protect the package from internal stress.

Ozawa and Kondo show all of the elements of the claims except the soft element being an elastomer or epoxy resin without a filler. It is well known in the art that encapsulant materials can be formed with or without fillers to form the encapsulant having a desired property (adhesive property, hardness property, etc.) However, Scranton et al. discloses (col. 17, lines 56-61) that an epoxy resin material may be formed without a filler to so that the resin has a putty-like property. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the soft element of Ozawa and Kondo by using an encapsulant material having no filler as taught by Scranton to form a soft element having a putty-like property.

In re claims 11 and 12, Kondo shows (fig. 2) that the surface comprises the entire surface that is contained by a single plane or that the surface comprises part of the entire surface that is contained by a single plane (as shown in figures 1 or 3).

In re claim 13, Ozawa discloses (col. 5, lines 50-65) that the encapsulant consists of an epoxy resin.

Claims 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hikita et al. (US 6,133,637) in view of Scranton et al. (US 6,099,783).

In re claim 14, Hikita et al. also disclose (col. 5, lines 8-55) a method of manufacturing a multi-chip package comprising: vertically stacking at least two semiconductor chips (14 and 16) on a substrate (lead frame 12a and 12b); the two chips having upper, lower, and side surfaces; bonding a bond pad (14b) on at least one of the at least two semiconductor chips to a bond finger (12b) on the substrate with a bonding wire (W); forming a soft element (26) on at least one side of at least one of the at least two chips; and encapsulating the semiconductor chips and the soft element using a mold resin (22). Hikita shows all of the elements of the claims except the soft element being an elastomer or epoxy resin without a filler. It is well known in the art that encapsulant materials can be formed with or without fillers to form the encapsulant having a desired property (adhesive property, hardness property, etc.) However, Scranton et al. discloses (col. 17, lines 56-61) that an epoxy resin material may be formed without a filler so that the resin has a putty-like property. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the soft element of Hikita by using an encapsulant material having no filler as taught by Scranton to form a soft element having a putty-like property.

In re claims 15 and 16, Hikita et al. shows (fig. 9) that the method includes forming the soft element on an entire surface of the upper chip (16) and a portion of the side of the lower chip (14).

Claims 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hikita et al. (US 6,133,637) in view of Scranton et al. (US 6,099,783) as applied to claim 14 above, and further in view of Kondo et al. (JP 63-240053 A).

In re claims 17-19, Hikita and Scranton show all of the elements of the claims except the soft element contacting the entire surface of the an uppermost chip of the at least two semiconductor chips. Kondo discloses (abstract and fig. 2) a soft element (flexible material 9) formed on an entire upper surface and side surface of a chip (1). The soft element is formed between the chip and the mold resin (3) to protect the package from internal stress. The soft element also covers the bonding wire (5), the contact pad on the chip and the bond finger (4). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the package of Hikita and Scranton by forming the soft element on the top surface of the chip and between the chip and the mold resin as taught by Kondo to protect the package from internal stress.

Allowable Subject Matter

Claim 23 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

Applicant's arguments filed with respect to claims 1-19 and 21 have been fully considered but they are not persuasive. The applicant primarily argues that the cited prior art references do not show all of the elements of the claims. The examiner believes that the prior art references show all of the elements of the claims.

In re the arguments that Hikita, Kondo, and Scranton do not disclose that the soft element (18) is more elastic and flexible than the mold resin (22) as recited in claim 1, the examiner believes that combined references disclose the limitation in question. Although Hikita discloses that the soft element (18) may comprise epoxy resin which is the same material as the package mold resin, Hikita also discloses that the soft element may comprise elastomer. Hikita's elastomer material as the soft element and the epoxy resin as the package encapsulant are the same materials as the applicant's claimed invention and would inherently have the same properties as the applicant's claimed invention. Even if Hikita could not be relied upon to disclose such a limitation, Scranton was cited to show that an epoxy resin could be formed without filler to give a putty-like (soft) property. Even further, Kondo specifically discloses that a flexible (soft) material (9) is formed in the package between the mold resin and the chip to protect the package from internal stress. Thus, the combined references show that the soft element is more elastic and flexible than the mold resin.

In re the arguments against the rejection of claims 8 and 9, the examiner believes that the rejection is still proper. The limitation of the package comprising solder balls as terminals connecting the package to an external circuit is not distinguishable

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over the cited art. It is well known in the art that solder balls are just one of a few connection schemes used for making an electrical connection. Although solder cream is used to secure the lead terminals of Hikita, a solder ball could easily replace the solder cream as the terminal of choice since cream or solid ball are both made of solder.

In re the arguments against the rejection of claims 10-13, the examiner believes that the rejection is still proper. The applicant asserts that when the flexible material of Kondo is applied to Kondo, the flexible material would be on the surfaces between the at least two semiconductor chips which is contrary to the limitations of the claims. The examiner agrees that because Ozawa has a stair-step stacked chip configuration, that the soft element would be formed on the exposed top surface of each stacked chip, but the examiner still maintains that the flexible material of Kondo would not be on the surfaces between the at least two semiconductor chips. As shown in fig. 5, the surfaces between two of the semiconductor chips (22, 23, or 24) have an adhesive (38) between them. Only the exposed upper surface of the next lower chip (23 or 24) does not have adhesive on it. Therefore, the flexible material of Kondo would not be formed on the surfaces between two semiconductor chips as stated in the claims.

In re the arguments against the rejection of claims 14-16, the examiner believes that the rejection is still proper. The applicant asserts that Hikita teaches in column 6, lines 25-27, that the inner package is formed of an epoxy resin with filler to increase its moisture resistance. This assertion leads the applicant to believe that changing the epoxy resin to not have a filler would destroy the intentions of Hikita. Although this may be the case, the examiner does not rely on the embodiment (for Fig. 9) for the rejection

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but rather relies on the first embodiment (of figs. 1-6) described in and beginning in column 4 and ending at line 55 of column 5. In that embodiment, Hikita does not recite whether the epoxy resin has a filler or not. So Scranton was relied upon to specifically teach that a filler or the absence of a filler in an epoxy resin changes the properties of the resin. In this case, no filler in the resin forms a putty-like substance. Therefore, the combination is proper and the combined references show all of the elements of the claims.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew E. Warren whose telephone number is (571)

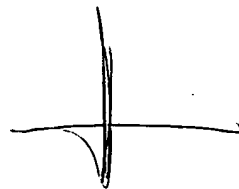
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272-1737. The examiner can normally be reached on Mon-Thur and alternating Fri 9:00-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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November 22, 2006



KENNETH PARKER
SUPERVISORY PATENT EXAMINER